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THE VETERINARY RECORD

Founded by William Hunting, F.R.C.V.S., in 1888

Volume 72
No. 27

SATURDAY, JULY 2nd, 1960

7 Mansfield Street,
London, W.1.
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A Review of Actinobacillosis with a Study of the Causal Organism

BY

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SUMMARY.—It was felt that as actinobacillosis is still of some economic importance a review of the condition with further information on the causal organism would be of value. Figures supplied by the Veterinary Department of the City of Birmingham Abattoir show that of 46,000 cattle slaughtered in 1958, 364 were diagnosed as suffering from actinobacillosis and actinomycosis. Of these it is estimated that approximately 85 per cent. had actinobacillosis and this incidence represents 0.67 per cent. of cattle received in Birmingham. These figures will, of course, vary throughout the country, but there is no doubt that a large number of animals will not be in as prime a condition as they should be because of this disease. Furthermore, animals other than cattle may be infected and the tongue is not the only organ which may be involved.

Twenty-six strains of A. lignieresi *were isolated and these together with 3 strains received from the N.C.T.C. were examined culturally, biochemically, and serologically.*

The cultural appearances of the freshly isolated strains were the same as those reported by previous workers with the exception of adherence of the organism to culture media. This was found to be due to cultural conditions and not a consistent characteristic of the organism.

As several of the biochemical reactions reported by previous workers were contradictory the 29 strains were carefully examined, and in the case of some biochemical reactions by a variety of methods. With the tests not previously reported the accepted routine methods were employed.

The strains were examined serologically using agglutination, agglutinin/absorption, and precipitin tests. The results obtained suggest that there are at least 2 serological types with the majority of organisms belonging to one type.

Attempts at finding the natural habitat of A. lignieresi *were made by determining the survival time of the organism under natural conditions, and by attempting to isolate it, using a selective medium, from normal tongues. The results of the survival tests suggest that the organism is probably an obligate parasite of animals although it was not isolated from normal tongues.*

IN 1903 Lignieres and Spitz described a condition in cattle involving the tongue and associated glands. The causal organism was found to be a small gram-negative coccobacillus. To differentiate this condition from actinomycosis they decided to call the infection actinobacillosis and the responsible organism *Actinobacillus*. Brumpt in 1910 proposed a generic group, *Actinobacillus*, with the species *lignieresi*.

Since 1903 *A. lignieresi* has been either suspected of or found infecting many other organs such as the digestive tract (Barratt, 1949), the udder (Dawson, 1945), the trachea (Bentellotti, 1942), the genital organs (Carbello, 1937; Menzani, 1933), the lungs (Cordy, 1949; Sforza, 1941), the pituitary body (Barboni, 1938), and the posterior limbs (Palotay, 1951).

Actinobacillosis has also been found in other animals, namely, sheep (Ravaglia, 1934; March & Wilkins, 1939; Tunnicliff, 1941; Wilson-Taylor, 1944; Hayston, 1948, and horses (Buay, 1948), while one author (Pacheco, 1934) reported finding it in a parakeet, although the organism isolated was not identical with *A. lignieresi*. There has only been one certain case of human infection (Beaver & Thompson, 1933), but other cases have been suspected.

With the discovery of actinobacillosis in South America this disease has been reported as infecting animals in many other parts of the world including Great Britain (Griffiths, 1915; Bosworth, 1923), Australia (Hayston, 1948), New Zealand (Linton, 1946), South Africa (Robinson, 1951), India (Mangrulkar, 1939), Kenya (Slavin, 1944; Daubrey, 1941), U.S.A. (Thompson, 1933), Italy (Angelucci, 1933), Eritrea (Sforza, 1941), and, according to Hayston (1948), Norway, Sweden and Denmark.

A review of the literature shows that although this organism has been recognised for over 50 years little has been reported about either its biochemical activity or its antigenic structure. The results of fermentation tests described by several authors are inconsistent, possibly due to variation in the media used. Attempts have also been made to determine the antigenic character of *Actinobacillus*, but the reported results do not show any distinct differences between the strains studied.

The material used for this study of the bacillus was obtained from the City of Birmingham Abattoir. Forty-two specimens from cattle were examined, of which 34 were diagnosed as actinobacillosis, 6 as actinomycosis, 1 in which both conditions were considered to be present, and 1 in which the diagnosis was not certain but actinobacillosis could not be excluded. The 42 specimens included 3 tongues, 38 heads, and 1 of the liver together with submaxillary gland. For further details about the specimens see Table I.

Of the 35 cases diagnosed as actinobacillosis, 33 were confirmed histologically, and from these 26 strains of actinobacillosis were isolated. These strains, together with 3 obtained from the National Collection of Type Cultures, were used for this study. In addition to these 29 organisms, Strain 22, which on preliminary examination appeared to be different from *A. lignieresi*, was included as a control.

Examination of the specimens showed that actinobacillosis is not confined to the tongue, the palate or the inside of the cheek, but may be found, pre-

TABLE I
DETAILS OF SPECIMENS TOGETHER WITH CULTURAL AND HISTOLOGICAL FINDINGS

Case number	Diagnosis		Tissues showing lesions									Cultural findings		Histology	
	Actino-bacillosis	Actino-mycosis	T	P	G	C	N	PAG	RPG	SMG	BS	Actino-bacillus	Actino-myces	Actino-bacillosis	Actino-mycosis
1	+		+						+			+		+	
2	+		+						+			+		+	
3	+		+						+	+		+		+	
4	+		+									+		+	
5	+			+				+	+	+		+		+	
*6	+			+		+	+	+	+	+		+		+	
7	+					+		+		+		+		+	
8	+		+							+		−	−		
9	+			+					+	+		+		+	
10	+		+	+	+		+			+		+		+	
11	+		+						+			−	−	+	
12		+				+		+		+		−	−	−	−
13	+								+	+		+		+	
14		+				+				+	+	−	−		+
15		+				+			+		+		+		+
*16	+													+	
17	+		+									+		+	
18		+				+					+		+		+
19	+		+						+	+		+		+	
20	+			+					+			−	−	+	
21	+			+					+	+		+		+	
22	+	+		+		+			+		+		+		+
*23	+		+						+	+		+		+	
24	+		+						+			+		+	
25	+		+						+			+		+	
26	+		+						+			+		+	
27	+		+						+	+		+		+	
28	Uncertain		+									−	−	−	−
29	+		+						+	+		+		+	
30	+			+					+			+		+	
*31	+									+		−	−	+	
32	+		+						+	+		+		+	
*33	+		+						+	+		+		+	
34		+				+				+	+		+		+
35		+				+					+		+		+
36	+		+						+	+		+		+	
37	+		+						+	+		+		+	
38	+			+					+	+		+		+	
39	+		+						+			−	−	+	
40	+		+						+			+		+	
41	+					+			+	+		+		+	
*42	+									+		+		+	

* Other organs etc. received showing lesions

Case 6 Lung Stomach mesenteric gland
Case 16 Lungs tracheo-bronchial glands
Case 23 Lungs Liver
Case 31 Liver
Case 33 Liver
Case 42 Liver trachea mediastinal glands

T = Tongue
P = Palate
G = Gingiva
C = Cheek
N = Nose
PAG = Pre-Auricular gland
RPG = Retro-Pharyngeal gland
SMG = Sub-maxillary gland
BS = Bone structures (jaw)

sumably as a metastasis, in the lungs, stomach, liver and associated glands (Fig. 1, 2, and 3).

The appearances of the lesions were similar to those described by other authors (Lignieres & Spitz, 1903; Palotay, 1951; Ravaglia, 1934; Hayston, 1948; Griffiths, 1915; Bosworth, 1923; Robinson, 1951; Thompson, 1933; Lucido, 1936; and Cavendoli, 1945). In early infections the nodules in the tongue were discrete, small in size (approximately 4 mm. in maximum length), and contained within a small area of tissue. They were similar in colour to the normal epithelium. In old infections the nodules were larger and often ulcerated (Fig. 4), and many were below the surface. These could be felt with the fingers. Often large areas of the tongue were involved, and in one case the tongue was swollen to such an extent that it protruded from the mouth for 2 to 3 inches (Fig. 5). When the glands were involved they were generally swollen and often contained nodules very similar in appearance to those found in the tongue (Fig. 6).

Histologically, actinobacillosis is similar to actinomycosis, and both are noted for the presence of "rosettes" or—as they are sometimes called—"club" or "ray" forms, which surround clumps of the infecting organism (Figs. 1 and 7). These structures are surrounded by a zone of inflammatory cells, among which giant cells may occasionally be found, and this zone is in turn surrounded by fibrous tissue. In chronic cases the lesions often become calcified. However, in actinobacillosis the structure of the "rosettes" is different from that found in actinomycosis because they generally form a compact mass with the organism in the centre (Fig. 7), whereas in Actinomycosis they are generally on the periphery of the colony. Examination of unfixed frozen sections of the lesions revealed that the "rosettes" were similar in appearance to those seen in sections of fixed tissue (Fig. 8).

Cysts of *Sarcosporidia* were found in 11 of the 23 tongues examined.

Primary cultures were made from the areas which contained the more numerous and larger nodules. The tissues were well cleaned and the selected surface was then sterilised by covering it with alcohol, draining off the surplus, and burning dry. An incision was then made with a sterile scalpel and the cut surface was scraped with the knife edge to obtain a sero-purulent exudate, which was sown on serum and blood agar plates and also into Robertson's anaerobic meat broth. Duplicate plate cultures were incubated aerobically and anaerobically at 37° C. for 1 week in order to cover the possibility of isolating an *Actinomycete* as well as the *Actinobacillus*. Smears were also made from the exudate and examined; but these proved of little value in cases of actinobacillosis because it was often difficult to find the organism on account of its small size and its gram-negative staining reaction.

A. lignieresi in artificial culture is a gram-negative, non-motile coccobacillus which will grow under aerobic, microaerophilic or anaerobic conditions, though not so well under the latter. It varies in shape and size according to the age of the culture and the medium on which it is grown. Young cultures grown on a suitable solid medium—for example, nutrient agar with or without the addition of an enrichment factor such as serum or blood—consist of coccobacilli arranged singly or in pairs, and occasionally in short chains. Nutrient broth cultures up to 24 hours old consist mainly of coccobacilli, arranged singly, in pairs, or in short chains with an occasional filament, and exhibit an even turbidity. In 48-hour cultures the filaments are more numerous, and after further incubation (up to 5 days) the even turbidity of the culture disappears because the organism forms clumps which often deposit. At this stage only an occasional filament can be found, the bulk of the growth consisting of coccobacilli. When grown in an unsuitable medium —for example, one with an initial acid reaction or one containing a sub-lethal concentration of a dye —its morphology is greatly changed, long S-shaped filaments predominating with only a very few coccobacilli.

A. lignieresi is not a fastidious organism, but like most parasitic bacteria, its growth is improved when certain enrichment factors are added to the medium. It will grow, for instance, on peptone-water agar and on McConkey's medium, though its growth on the latter is feeble. It will not grow on Leifson's medium, and nutrient agar enriched with either whole blood or serum is undoubtedly its optimal medium.

Colony size	24 *hr.*	48 *hr.*	96 *hr.*
Peptone-water agar	1·0 mm.	1·5 mm.	2·0 mm.
Nutrient agar	1·5 mm.	2·0 mm.	2·5 mm.
Serum agar	2·0 mm.	3·0 mm.	4·0 mm.

Colony shape and structure agreed with the descriptions of other workers (Lignieres & Spitz, 1903; Bosworth, 1923; Linton, 1946; and Angelucci, 1933)., that is to say, the colonies were moist, semi-opaque, smooth and domed, with entire edge, and when viewed by daylight, appeared to be a bluish-green in colour; they were also non-haemolytic. Lignieres and Spitz noted on primary isolation that the *Actinobacillus* had a tendency to adhere to the medium and that this property disappeared on subculture. With the exception of Strain 10, none of our strains showed this characteristic. Strain 10 adhered to the medium at times, particularly when grown on a nutrient agar slope. However, when reconstituted dehydrated media were used, it was noted that many strains occasionally showed adherence to the medium, particularly when the surface of the agar slope was dry. It seems, therefore, that adherence to the culture medium is dependent on environmental conditions, and is not a consistent characteristic of the organism.

By auxanography, using a basal salt-agar medium, no single amino-acid or combination of single amino-acid and growth factors could be found to support the growth of *A. lignieresi*.

Biochemistry (Fermentation Tests)

As the results of biochemical tests performed by earlier workers are conflicting, due probably to variations in culture media and methods, it was decided to examine the biochemical reactions of the bacillus by a method which would be reproducible.

It was thought that the microbiochemical tests of Clarke and Cowan (1952) might provide more standard results, because they are made with preformed enzymes and are not influenced by lengthy incubation times and growth factors other than the sugar under test. Unfortunately, it was found that they were not suitable for the following reason: *A. lignieresi* does not grow prolifically, and consequently a negative result does not necessarily represent the organism's inability to ferment the sugar or break down the substrate, as the failure might be due to insufficient growth. (It would be necessary to grow the organism in the presence of the sugar, before carrying out the test, thus ensuring that the organism is actively producing the necessary enzyme.)

It was decided, therefore, to ascertain the fermentation capabilities of *A. lignieresi* by growing the strains in the routine medium of 1 per cent. w/v of the sugar plus 1 per cent. bromo-thymol blue added to peptone water at *p*H 7.4 This medium was sterilised by steaming for 20 minutes on each of 3 successive days. The tests were put up in duplicate, the cultures being incubated at 37° C. for a total of 21 days.

The interpretation of the results of fermentation tests is not easy because the amount of acid produced by the Actinobacillus is small; for example, in the fermentation of glucose—a sugar which the Actinobacillus readily ferments—the maximum degree of fermentation achieved was manifested by a fall in the hydrogen-iron concentration to an endpoint of *p*H 6.0; the majority of strains produced a fall to only *p*H 6.4 to 6.7. Table II shows the incubation times necessary for the fermentation of a variety of sugars.

TABLE II
INCUBATION TIME FOR THE FERMENTATION OF SUGARS

Sugar	24 hours	72 hours	7 days	21 days	Variable	Negative
Fructose	+					
Glucose	+					
Mannose	+					
Sucrose	+					
Arabinose		+				
Galactose		+				
Lactose		+				
Maltose		+				
Mannitol		+				
Xylose		+				
Starch		+			+	
Dextrin			+		+	
Glycerol			+			
Adonitol				+	+	
Cellobioze				+	+	
Dulcite				+	+	
Erythritol				+	+	
Glycogen				+	+	
Inositol				+	+	
Inulin				+	+	
Melibioze				+	+	
Melizitose				+	+	
Raffinose				+	+	
Rhamnose				+	+	
Sorbitol				+	+	
Trehalose				+	+	
Aesculin						+
Salicin						+

+ = Acid, no gas.

Other Biochemical Tests Performed by Routine Methods

All the strains of *A. lignieresi* isolated from the specimens and the N.C.T.C. strains were tested. *Pasteurella septica* and pseudotuberculosis were used as controls, except in some instances where these were not suitable, when other gram-negative organisms which gave positive and negative reactions were used.

Indole

There are differences of opinion as to whether *A. lignieresi* produces indole or not. Lignieres and Spitz (1903) obtained a positive result; Brumpt, Topley and Wilson (1948) reported that small quantities of indole were produced, but Tunnicliff (1941) and Bosworth (1923) obtained negative results. Immediately after isolation all our strains (26 in number) were tested for their production of indole using Erhlich's reagent but every culture gave a negative response. In view, however, of the original report of a positive indole test by Lignieres and Spitz, and the findings of Tunnicliff and Bosworth, we decided to make further tests to determine whether or not indole could be produced by *Actinobacillus*.

Experiment 1. Use of various peptones. Five different brands of peptone were tried, namely Oxoid, Difco, Fairchild, Evans and Turner. Cultures were grown in each of the peptone waters at 37° C., and were then tested at intervals of 24 hours, 72 hours, and 5 days, using Kovac's reagent. All the results were negative.

Experiment 2. Use of various methods of detecting indole. Cultures were grown in peptone water containing 0.1 per cent. tryptophan at 37° C. for 5 days.

Methods

1. Addition of Erhlich's reagent.
2. Addition of Kovac's reagent.
3. Extraction with chloroform and the addition of Erhlich's reagent.
4. Extraction with ether and the addition of Erhlich's reagent.
5. Extraction with xylene and the addition of Erhlich's reagent.
6. Addition of a sat. sol. of Pot. persulphate and addition of Erhlich's reagent.
7. Addition of a sat. sol. of Pot. persulphate and addition of Kovac's reagent.

The results of these tests conclusively demonstrated that none of our strains produced indole.

Experiment 3. Homan and Gonzales recommended the demonstration of indole by its volatility; this method was later modified by Brawn and Silberstein (see Topley & Wilson).

Each strain was inoculated on a peptone agar slope containing 0.1 per cent. tryptophan. A strip of filter paper soaked in para-dimethylaminobenzaldehyde solution and dried, was placed between the cotton wool plug and the side of the test-tube of each culture, which were then incubated for 5 days at 37° C. Indole formation was not detected during this period.

Experiment 4. In view of the better growth

obtained in nutrient broth and digest broth, and the reporting of the production of indole in pancreatised broth by Lignieres and Spitz, our strains were grown in nutrient broth and digest broth at 37° C. The duplicate cultures were tested after 24 hours, 36 hours, and 5 days for the presence of indole by both Erhlich's and Kovac's reagents. Indole was not demonstrated.

It would appear from these experiments that *A. lignieresi* does not produce indole either on primary isolation or after prolonged cultivation.

Voges-Proskauer Test

Testing for the presence of acetoin was performed after 5 days' incubation in glucose phosphate broth by (a) the addition of 40 per cent. NaoH and creatine to the cultures, and by (b) Barratt's method. Only the latter showed that 9 strains produced very small quantities of acetoin.

Since it has been found that the growth of *A. lignieresi* was poor in media containing only peptone as the source of protein, a nutrient broth containing glucose and dipotassium hydrogen phosphate was also tried. This medium was inoculated and incubated for a period of 5 days, and the cultures were then tested by Barratt's method. Every one of them gave a positive reaction for acetoin.

The results shown in the following list of biochemical tests were obtained by using the routine methods recommended by Topley and Wilson. In the test for H_2S production a medium composed of 0.1 per cent. cysteine hydrochloride in nutrient agar was employed. Hydrogen sulphide was demonstrated by the blackening of filter paper strips previously soaked in a solution of 10 per cent. lead acetate.

Methyl-red test	Negative
Nitrate reduction	Negative
Catalase production	Positive (small quantities)
Methylene blue reduction	Positive
H_2S production	Positive
Ammonia production	Negative
Koser citrate	Negative

Serology

Several attempts have been made to analyse the *Actinobacillus* antigenically (Thompson, 1933; Tunnicliff, 1941; Wilson-Taylor, 1944), and the results obtained by these authorities show that strains are agglutinated by specific antisera and that there is sufficient difference in the titres to suggest differences in antigenic structure.

Agglutinin/absorption tests performed by Thompson (1933), though not entirely conclusive, confirmed the opinion that there was a serological difference which was not sufficiently marked, however, to justify placing the strains in separate groups.

We decided, therefore, to test whether our freshly isolated strains were serologically related to those kept by the N.C.T.C., and to examine the possibility of there being separate serological types.

The antigens (vaccines) used for immunisation were prepared by growing the organisms overnight on nutrient agar. The growth was harvested and washed twice in saline, then killed by heating at 60° C. for ½ hour. (It was found that the *Actinobacillus* in a liquid medium was killed at 55° C. in from 30 to 40 minutes and in 20 minutes at 60° C.) The strains were then resuspended in phenol-saline and standardised against a No. 10 Wellcome opacity tube.

Antigen suspensions made from Strains 6, 10, 24, 36, and 4189 were injected intravenously into rabbits, which had been previously tested to ensure absence of natural antibodies, in graded doses of 0.1, 0.2, 0.5 and 1.0 ml., the last volume being repeated until a high titre was obtained. The rabbits were test bled at intervals to determine the titre and were each given a total of 13 injections. The resulting titres were found to vary from 1:1,000 to 1:5,000.

The antigens for the agglutination tests were prepared by the same technique as those for immunisation, except that they were standardised against a No. 1 Wellcome opacity tube. For these antigens, 0.5 per cent. phenol-saline and 1/10,000 methiolate in saline were tried as preservatives. Phenol-saline proved satisfactory whereas the methiolate induced auto-agglutination.

As previous workers had observed prepared antisera agglutinated all strains of *Actinobacillus* but with variation in the titre (see Table III, Section A). This variation was most marked with Strains 3, 10, 13, 23, 33, 40, and 4189 against serum C6, whilst other strains were agglutinated in a dilution range of 1/500-1/3,000; Strains 3 and 10 were agglutinated to only 1/125; Strains 13, 23, 44 and 4189 to only 1/50; and Strain 40 to only 1/25.

With the antiserum B10 most of the strains were agglutinated within a titre range of 1/125-1/1,000, and a majority of these was agglutinated at titres between 1/750 and 1/1,000. Strains 33, 40, and 4189 were execeptions as these were only agglutinated at a dilution of 1/50.

The antiserum prepared against No. 4189 proved to be strain specific.

As our results indicated that there was some difference antigenically between the strains we decided to try agglutinin/absorption tests to determine whether there was any distinct antigenic difference.

Two nutrient agar plates were mass-inoculated with the strain to be used for absorption and the cultures were incubated at 37° C. overnight The resulting growth was washed off with saline; centrifuged; washed twice; killed by heating at 60° C. for ½ hour, and after centrifuging, was then suspended in 2.5 ml. of a 1/10 dilution of the antiserum. The mixture was then incubated at 37° C. for 3 hours or left overnight in the refrigerator. Agglutination tests were performed with the homologous and the absorbing strain. Absorption of agglutinin tests were made with sera C6, B10, G24, and H36 at a serum dilution of 1/25.

When each of the sera C6, G24, and H36 was absorbed with Strains 6, 24, and 36, complete absorption was obtained; but when these sera were absorbed with Strains 3, 10, 13, and 23, all strains were agglutinated with the exception of 3, 10, 13, 23, 33, 40, and 4189. A complete list of results is given in Table III, Section B.

When serum B10 was absorbed with Strains 3,

TABLE III
SEROLOGICAL TESTS

	Section A				Section B								Section C	
					Serum C6 absorbed with				Serum B10 absorbed with					
	C6	B10	H36	G24	3	10	13	23	6	23	24	36	C6	B10
1	1,500	125	3,500	1,000	+	+	+	+	−	−	−	−	+	−
2	500	125	125	125	+	+	+	+	−	−	−	−	+	−
3	125	1,000	250	125	−	−	−	−	+	+	+	+	−	+
4	1,500	750	1,000	1,000	+	+	+	+	−	−	−	−	+	−
5	1,500	250	1,500	1,000	+	+	+	+	−	−	−	−	+	−
6	3,000	1,000	5,000	1,000	+	+	+	+	−	−	−	−	+	−
7	2,000	1,000	5,000	750	+	+	+	+	−	−	−	−	+	−
9	1,000	750	1,000	750	+	+	+	+	−	−	−	−	+	−
10	125	1,000	750	750	−	−	−	−	+	+	+	+	−	+
13	50	1,000	1,000	500	−	−	−	−	+	+	+	+	−	+
19	500	250	1,000	500	+	+	+	+	−	−	−	−	+	−
22	—	—	—	—	−	−	−	−	−	−	−	−	−	−
23	50	250	125	750	−	−	−	−	−	−	−	−	−	−
24	500	250	1,000	1,000	+	+	+	+	−	−	−	−	+	−
25	2,000	750	1,000	1,000	+	+	+	+	−	−	−	−	+	−
26	1,500	750	1,000	750	+	+	+	+	−	−	−	−	+	−
27	1,500	1,000	1,500	750	+	+	+	+	−	−	−	−	+	−
29	1,500	750	4,000	750	+	+	+	+	−	−	−	−	+	−
30	1,500	750	5,000	1,000	+	+	+	+	−	−	−	−	+	−
32	1,500	750	3,500	750	+	+	+	+	−	−	−	−	+	−
33	50	50	125	25	−	−	−	−	−	−	−	−	−	−
36	1,500	1,000	5,000	750	+	+	+	+	−	−	−	−	+	−
37	2,500	750	2,500	750	+	+	+	+	−	−	−	−	+	−
38	1,000	750	1,000	750	+	+	+	+	−	−	−	−	+	−
40	25	50	25	750	−	−	−	−	−	−	−	−	−	−
41	250	125	1,000	250	+	+	+	+	−	−	−	−	+	−
42	2,500	750	1,000	750	+	+	+	+	−	−	−	−	+	−
4,189	50	50	50	50	−	−	−	−	−	−	−	−	−	−
4,975	500	750	2,000	750	+	+	+	+	−	−	−	−	+	−
4,976	500	500	2,000	750	+	+	+	+	−	−	−	−	+	−

Section A. Titre obtained against sera C6, B10, H36 and G24.

Section B. Results of agglutinin/absorption tests + = agglutination.

Section C. Results of precipitin tests against sera C6 and B10 + = precipitation.

10, and 13, complete absorption was obtained; but when this serum was absorbed with Strains 6, 23, 24, and 36, only Strains 3, 10, and 13 were agglutinated. Strains 23, 33, 40, and 4189 were not agglutinated by any of the absorbed sera.

Sera G24 and H36 were also absorbed with Strains 3, 10, 13, and 23, and the results were identical with those obtained with serum C6.

No previous attempt to examine this group of organisms antigenically by precipitin tests has been reported.

Lancefield's and Fuller's methods of extraction were tried, and of the two it was found that Lancefield's method produced stronger antigenic extracts when it was modified by using 2 × 25 ml. quantities of glucose broth for the medium and the amount of HCl used for extraction was reduced to 0.3 ml. of N/20. The usual ring technique was used in a Pasteur pipette for obtaining precipitation and the results are given in Table III, Section C. It is obvious that no further information was obtained by the precipitin tests, but they confirm the results of the absorption of agglutinin tests.

It would appear from the results described that an antiserum prepared against any one strain of *Actinobacillus* should agglutinate all other strains, but the antiserum prepared against Strain 4189 proved to be type specific. The possible explanation of this exception is that Strain 4189 was highly type specific and produced an essentially type specific antibody. This suggestion is supported by the poor titres obtained with this strain against the antisera C6, B10, etc., and also the poor reactions obtained with Strains 33 and 40 which may also have highly type specific antigens.

Results of absorption of agglutinin tests suggest that the strains of *Actinobacillus* tested fall into at least 2 types, of which one contains 22 of the strains and the other 3. Strains 23, 33, 40, and 4189 did not appear to belong to either of these 2 types so that it is possible that there may be additional type or types.

The value of precipitin tests is limited because they are type specific and are not suitable for the identification of an organism suspected to be *A. lignieresi*, unless it belongs to the type of organisms against which the antiserum has been prepared.

Several authors (Gerring, 1947; Robinson, 1951; Ravaglia, 1934) have suggested possible causes for the isolated cases and sporadic outbreaks of actino-

bacillosis in cattle, and the concensus of opinion is that the eating of spiky foodstuffs produces trauma through which the organism invades the tissue. Whilst this may well be the governing factor of the disease, the natural habitat of the organism has not been investigated and is unknown, though there would appear to be two possible sources: (1) it may be an inhabitant of the soil, and, therefore, contaminate hay, straw, and similar foodstuffs; or (2) it may be an oral commensal. The first possibility was investigated by determining the survival time of the organism; the second by attempting to isolate it from the mouths of normal cattle.

Hay and straw were placed in bottles plugged with cotton wool and sterilised by autoclaving. Three samples of hay and straw were then inoculated with *A. lignieresi* by covering each with a broth culture and leaving for 5 minutes, after which the culture was decanted. The inoculated hay and straw samples were then placed in (a) an animal-room where the temperature was maintained at approximately 70° F.; (b) an outside brick-built hay-shed with no heating; and (c) the open air. The experiments were repeated several times in both winter and summer with the constant finding that the survival time of *A. lignieresi* never exceeded 5 days. This short extra-corporeal survival time suggests the bovine mouth is more likely to be the natural habitat. Swabs of the mouth were, therefore, taken from 30 cattle and inoculated on to nutrient agar plates. After overnight incubation the plates were examined and colonies with similar characters to those of *A. lignieresi* were subcultured, examined microscopically, and put through the routine biochemical tests of fermentation of glucose, lactose, sucrose, and salicin; indole production and the V.P. and M.R. tests. None of the organisms isolated gave results identical with those of *A. lignieresi*.

In view of the heavy growth obtained, attempts were made to produce a selective medium, and the following is a list of substances, etc., which were tested, with the results obtained with *A. lignieresi*.

Nutrient agar at	pH 5	Growth
" " "	" 6	Growth
" " "	" 8	No growth
" " "	" 9	No growth
" plus	3 per cent. sod. chloride	No growth
" " "	6 per cent. sod. chloride	No growth
" " "	1/30,000 thionin	Growth
" " "	1/25,000 basic fuchsin	Growth
" " "	1/1,000 pot. tellurite	No growth
" " "	1/10,000 methylene blue	No growth
" " "	1/50,000 crystal violet	No growth
" " "	1/2,000 phenol	Growth
" " "	1/1,000 "	No growth

Sensitivity to Antibiotics Using Sen-test Tablets on Nutrient Agar

Penicillin 0·5 I.U.	Insensitive
" 2·5 "	Sensitive
Streptomycin	Sensitive
Chloramphenicol	Sensitive
Aureomycin	Sensitive
Terramycin	Sensitive
Erythromycin	Sensitive
Tetracycline	Sensitive
Neomycin 10 ugs.	Insensitive
Neomycin 100 ugs.	Slightly sensitive
Bacitracin	Insensitive
Novobiocin	Insensitive
Oleandomycin	Insensitive
Nystatin	Insensitive

Based on these results, combinations of different reactions of the medium and dyes were tried, but only 1/25,000 concentration of basic fuchsin in nutrient agar at *p*H would allow *A. lignieresi* to grow. Unfortunately, when tested, this medium would not inhibit likely contaminating organisms such as those belonging to the genus *Bacillus* and "coliform-type" organisms.

In view of the results obtained with antibiotic sensitivity tests, and the report of a selective medium for *Pasteurella* incorporating antibiotics by Morris (1958) various combinations of antibiotics and media were tried. It was found that a medium composed of Hartley's digest agar, with the addition of 10 per cent. Fildes' peptic blood digest, 20 μg. per ml. of Oleandomycin, and 1.5 μg. per ml. of Neomycin, provided the maximum inhibition of contaminating organisms and allowed the maximum number of strains of *A. lignieresi* to grow.

Approximately 150 samples were taken from normal cattle tongues which were swabbed immediately after the animals were killed, and inoculated on to this medium. The cultures were incubated overnight and examined. Although several organisms were isolated which gave biochemical reactions similar to those of *A. lignieresi*, none of the organisms was agglutinated by antisera C6 or B10. Furthermore, these organisms were not morphologically similar to *A. lignieresi*; invariably they were much larger, gram-negative rods. Nevertheless, we still consider that *A. lignieresi* must reside in the mouth. Failure to isolate it may be due to several reasons, such as the small number probably present in the mouth of normal cattle which would greatly reduce the chance of gathering them on a swab, and a restricted distribution in the oral cavity, because they may be confined, for example, to the tonsillar area or to the gingiva.

Acknowledgments.—We should like to thank Professor J. F. D. Shrewsbury and Dr. N. Laughton for their help and advice during this investigation, and also Professor Shrewsbury for his permission to publish this paper.

To Mr. W. S. Davidson, Veterinary Officer to the City of Birmingham Abattoir, we should like to extend our appreciation of his help in supplying the specimens and the swabbing of the cattle.

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Osteoarthritis in Cattle

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Introduction

OSTEOARTHRITIS (synonyms, arthritis deformans, degenerative arthritis, hypertrophic arthritis) is a type of chronic arthritis in which, according to Collins (1949), "joint cartilage is destroyed by friction acting in conjunction with an intrinsic process of cartilage degeneration. . . ." Medical literature abounds with references concerned with clinical observations and research into this particular form of joint disease in man. In comparison, apart from some comparative pathological studies that have been conducted in cattle (Bennett & Bauer, 1931) and horses (Hare, 1927; Callender & Kelser, 1938), very little information is available regarding the disease as it affects animals. While conducting investigations into lameness in cattle, however, the present author has encountered joint disease characteristic of osteoarthritis on many occasions. In this paper it is intended to describe the clinico-pathological aspects of osteoarthritis as it has been seen affecting the stifle or hip joints in 13 animals.

It is important in the first instance to draw attention to the basic changes that occur in a joint which enable one to classify the disease as osteoarthritis. It will be most convenient to consider the component parts of the joint in turn and to describe the naked-eye lesions that occur.

A Review of Actinobacillosis.—*Concluded.*

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1. *Articular Cartilage*

The earliest changes are seen in those areas of the joint that are subjected to the greatest pressure and movement. The cartilage loses its sheen and there appear foci of fibrillation, or even shallow pits and grooves. Fibrillation of cartilage is highly characteristic of osteoarthritis and is an expression of cartilage injury. Cartilage always splits along its fibrillary planes and the resultant lesion appears rough with threads hanging loosely. At first the foci are small but as the disease progresses large areas of cartilage are involved.

In due course the cartilage becomes thin and in places is completely worn away exposing the bone.

2. *Bone*

Before the cartilage is entirely removed the bone beneath has been made stronger by means of a thickning of the subchondral plate; naturally this must largely depend on the rate at which the cartilage is lost. As a result of constant friction with the opposite joint surface the exposed bone develops a hard, smooth appearance which from its resemblance to ivory is known as eburnation. Eburnation controls the process of attrition although the opposing surfaces in time do tend to adapt to one another in contour.

Osteophytes form at the joint edges. They are also very characteristic of osteoarthritis and always indicate gross cartilage damage to the surface they border. Eventually osteophytes fuse to form large blocks of bone.

3. *Joint Capsule*

As the disease progresses the joint capsule undergoes fibrosis. The synovial membrane is also thickened and its surface is often covered with a velvet-like pile of red villi. An excess of an abnormally viscid synovia is often present in the advanced stages. In the case of the knee joint the intra-articular cartilages or menisci are torn and ragged or may even have disappeared except for the periphery which is now grossly fibrotic.

It will have been realised from the foregoing that the degree of damage in an osteoarthritic joint varies considerably. When referring to the status of afflicted joints in man, Collins (1949) has preferred to use a system of 4 pathological grades, a classification that has the merit of precluding such terms as "mild," "moderate," "severe," which are difficult to standardise. Briefly, Grades I and II represent the mild or early stages of the disease in which the main change is fibrillation of articular cartilage in differing degrees; these joints are mostly clinically silent. Grades III and IV are applied to the severe or advanced stages where there is extensive eburna-

tion and prominent marginal hyperplasia; these joints give rise to marked symptoms or even disability.

Clinical Features

Reference will be made here only to those cases where it has been possible to follow up clinical examination of the patient by the dissection of the affected limb or limbs on *post-mortem* examination. An analysis of the 13 cases that fall into the aforementioned category is given in Table I.

The material will be seen to incude 11 cows and 2 bulls. Their ages ranged from 2 to 15 years, giving an average age of 8 years. A variety of breeds was represented, as follows: Jersey (4), Friesian (3), Hereford (3), Shorthorn (2) and Ayrshire (1). Five of the cows were more than 6 months pregnant at the time of the onset of lameness.

Only in 2 instances was there a definite history of an injury immediately preceding the lameness; one bull caught his foot in a hole in the ground during service, and one cow had fallen into a ditch. Circumstantial evidence of injury was offered for 2 cows that had been seen "riding" other cows just before the lameness was noticed.

The present author has little first-hand information regarding the status of the limb in the early stages because the majority of these animals were referred by practitioners and there frequently was a lapse of 2 to 4 weeks before personal observations could begin. The lameness in each animal was sudden in onset but was not so marked initially as to occasion the owner a great deal of concern.

It was usual within the first week, however, for the animal to become less inclined to move, and to find rising and going down particularly difficult. In the following weeks the lameness gradually worsened. There was also a concurrent loss of bodily condition and in milking cows the milk yield fell sharply.

When first examined, some 2 to 4 weeks after the first evidence of limb dysfunction, each animal was acutely lame. Palpation and manipulation of the affected limb revealed signs that were thought to clearly indicate joint disease. In the case of the stifle joint, a constant feature was a gross thickening of the periarticular tissues and this was especially noticeable when comparing the overall width (lateral-medial direction) of the affected with the opposite and normal joint.

Manual flexion and extension of the limb caused the animal considerable discomfort and these movements were invariably accompanied by crepitation from the stifle joint. The degree of crepitus varied from an occasional clicking noise to sounds which can be most accurately described in unscientific terminology as crackling, grating and grinding.

The range of rotational, lateral and antero-posterior movement was distinctly abnormal in some of the joints and this was later found to be an indication of extensive destruction of bone, fragmentation of the menisci, rupture of the cruciate ligaments, either occurring separately or in some combination. The manipulations necessary to detect these abnormalities in joint movement could usually be accomplished with animals of the smaller breeds in the standing position, but the bigger beasts (Herefords, Friesians) had first to be cast.

There were 2 animals in this series with osteo-arthritis of the hip joint. In each a pronounced crepitation was emitted from the hip region during abduction and circumduction of the limb. A rectal examination was essential for the more accurate location of the crepitus to the joint, and at the same time allowed one to negative the presence of certain pelvic

TABLE I

No.	Breed	Sex	Age	History			Joints affected Pathological grading (after Collins 1949)	Bacteriological examination
				Cause	Period of lameness before slaughter	Pregnancy		
			years					
1	Friesian	F.	10	Unknown	1 month	6 months	Left stifle; Grade IV	Not examined.
2	Hereford	F.	8	Unknown	1 year	Barren	Left stifle; Grade IV	Not examined.
3	Jersey	M.	3	Caught foot in hole in ground during service	1 month	—	Left stifle; Grade IV	Not examined.
4	Hereford	F.	6	Unknown	Several weeks	8 months	Right stifle; Grade IV	Synovial fluid sterile.
5	Jersey	F.	6	Unknown	Several months	Barren	Left stifle; Grade III Right stifle; Grade III	Not examined.
6	Jersey	F.	7	Unknown	5 months	Barren	Right hip; Grade IV Left hip; Grade IV Left stifle; Grade III	Synovial fluid sterile.
7	Shorthorn	F.	15	"Riding" another cow	4 to 5 weeks	Barren	Left stifle; Grade IV	Synovial fluid sterile.
8	Shorthorn	F.	10	"Riding" another cow	4 weeks	8 months	Left stifle; Grade II Right stifle; Grade IV	Synovial fluid sterile.
9	Jersey (Dam of No. 6)	F.	8½	Unknown	6 months	Barren	Right stifle; Grade IV Left stifle; Grade III	Synovial fluid sterile.
10	Polled Ayrshire	F.	9	Unknown	3 to 4 weeks	8½ months	Left stifle; Grade III	Not examined.
11	Friesian	F.	15	Unknown	1 year	Barren	Left stifle; Grade IV	Not examined.
12	Hereford	M.	2	Unknown	6 months	—	Right and left hip Grade IV	Not examined.
13	Friesian	F.	10	Fell in ditch	18 months	8 months	Left stifle; Grade IV	Synovial fluid sterile.

fractures. The region of the great trochanter of the femur was particularly prominent as a result of the fibrosis that had taken place in the tissues adjacent to the hip joint. The position of the great trochanter in relation to the tuber ischii and the tuber coxae was normal; a state of affairs that was considered of help in eliminating the possibility of hip luxation.

Intra-articular anaesthesia was employed in several cases where the clinical examination had indicated that this stifle joint was affected, in order to confirm that the focus of pain was actually situated in this joint. With strict aseptic precautions the injection was made in the standing animal at a site just lateral to the middle patellar ligament. After making a skin weal, a long needle (4-inch, 18 B.W.G.) was inserted through the skin and directed into the femoro-tibial joint. Synovia escaped when the required penetration had been achieved, whereupon 15 to 20 c.c. of a local anaesthetic* was injected into the joint. When the full desensitising effect had been reached, usually in 10 to 15 minutes, the animal moved more willingly and the degree of lameness was considerably reduced. The success of this technique in alleviating pain makes it a useful aid to diagnosis, but it obviously is limited to those joints which are readily approachable, a restriction that obviates its use at the hip.

The use of radiography as a diagnostic aid has, in this series, been limited to the examination of the stifle joints because high-quality radiographs of the hip joint are impossible without an extremely powerful X-ray unit. With the larger breeds the stifle region too was difficult to penetrate especially in the anterior-posterior plane and the resultant plates were only of use where there was obvious bone loss or marked osteophyte formation (Fig. 1). In the Jersey cattle, however, the quality of plate was better and it was even possible to demonstrate small erosions of bone, "joint mice," small foci of marginal hyperplasia, and abnormalities in joint space, and hence confirm the presence of an arthritic process.

Pathological Findings

All 13 animals in the series under review here were destroyed because of a disabling lameness. The interval between the onset of lameness and slaughter varied from 1 to 18 months. This wide variation was governed in part by the degree of lameness but economic considerations were also involved, as usually the owner was loath to cull a heavily pregnant cow or to have a valuable bull destroyed until it had become patently obvious that the damaged joint was beyond repair.

The majority were accepted at abattoirs dealing with meat for human consumption which precluded a complete *post-mortem* examination. On every occasion, however, the interior of the affected joints were inspected immediately after death. The joints were collected from the butcher some days later after all the consumable meat had been removed. More detailed dissections were possible in those cases that had been sent to the knackeryard.

A summary of the naked-eye lesions that were discovered in the joint material collected from the 13 cadavers is recorded below. Using the pathological grading of Collins (1949) as indicated in Table I, all the joints examined were considered in the categories of Grades III or IV. The stifle and hip joints have for the purpose of convenience been considered separately.

*Xylotox.

Stifle Joint

(a) *Cartilage*

Areas of fibrillation, thinning and total loss of cartilage were observed in different regions of the joint. Consequently the cartilage surfaces were grossly irregular. The extent of the lesions varied immensely and were to a great extent relative to the duration of the lameness. The commonest sites of severe damage were situated on the central parts of the medial and lateral femoral condyles, and those areas either side of the tibial spine which are, in the normal joint, not covered by the menisci. The cartilage on the femoral trochlea and patella remained remarkably free from injury apart from small areas of fibrillation. In only one instance was there a region of the patella and opposite trochlea that was denuded of cartilage.

(b) *Bone*

Gross destruction of bone and areas of eburnation were encountered. The most massive loss of bone was seen in those cases which had to be destroyed because of crippling lameness within a month of its onset. The sites particularly involved in this destructive process were the femoral condyles and the posterior rim of the tibial condyles. The quantity of bone lost was quite staggering, for example, in one joint a femoral condyle had been reduced to half its size (Fig. 2) and there was an estimated loss of 22 mm. of bone from a tibial condyle in another (Fig. 3). A fracture of the posterior rim of a tibial condyle, and also of the tibial spine were discovered in two different joints. It appears likely that these fractures were in fact preliminary stages in the process of bone destruction.

The size of the eburnated areas varied greatly. In some joints they were postage stamp in size (Fig. 4) whereas in others the entire joint surfaces were involved (Fig. 5). As a rule the opposed surfaces (femur, tibia) were similarly affected and their contours had adapted to each other. On occasions there were one or more craters in the eburnated surfaces which appeared to penetrate into the cancellous bone.

(c) *Menisci*

In the majority of the severely affected joints the menisci had been almost completely lost. All that remained was the periphery of the fibrocartilage and this in several cases had become ossified. Where there was less extensive joint damage the menisci were usually intact but their surfaces were fibrillated and frequently there were extensive tears in their substance (Fig. 6).

(d) *Osteophytes*

Exostoses were particularly prominent in the long-standing cases. The most extensive production of new bone had occurred at the margins of the medial

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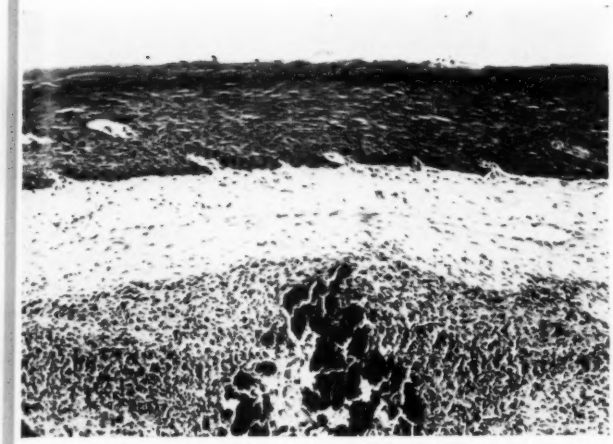

FIG. 1.—Section of tongue showing actinobacillary lesion below the epithelium, × 100; stained with haemotoxylin and eosin.

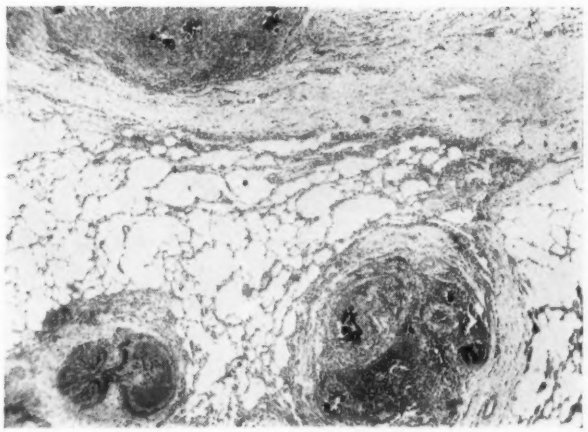

FIG. 2. Section of lung showing granulomatous nodules, × 20; stained with haematoxylin and eosin.

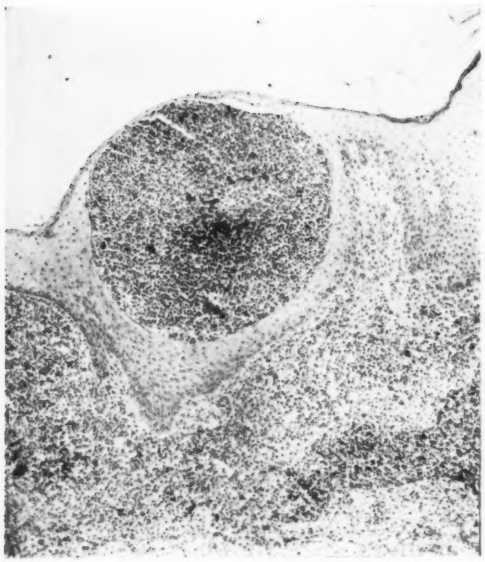

FIG. 3.—Section of stomach (proventriculus) with contained area of inflammatory cells; the typical "rosettes" of actinobacillosis are small in this instance and are consequently not visible at this magnification, × 60; stained with haematoxylin and eosin.

FIG. 4.—Whole tongue with numerous lesions, some of which are ulcerated.

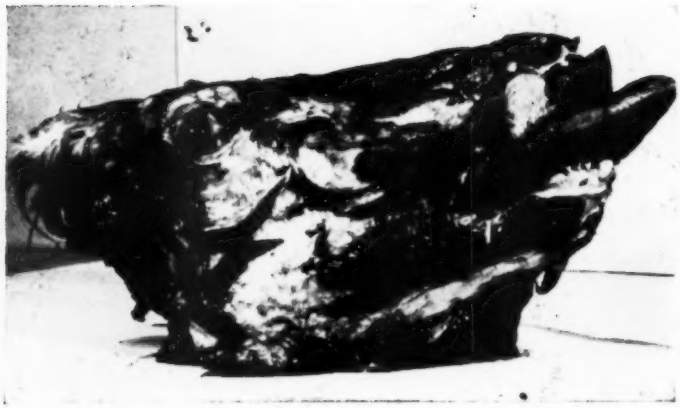

FIG. 5.—Ox head with swollen protruding tongue.

FIG. 6.—Large sub-maxillary and retro-pharyngeal lymph glands containing numerous lesions, several of which are situated just below the surface.

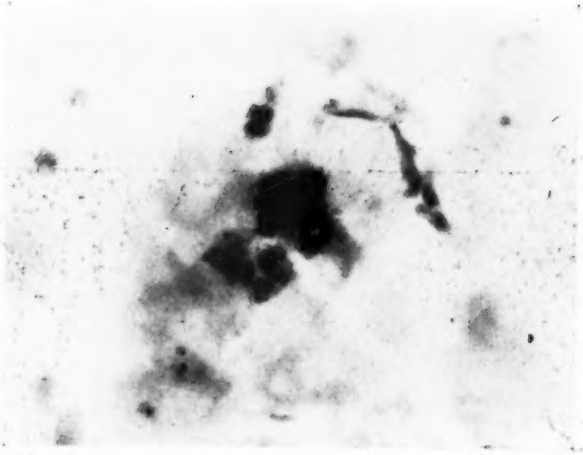

FIG. 7.—Small "rosette" (clubs) with a colony of *A. lignieresi* in the centre. × 1,200; stained with Giemsa.

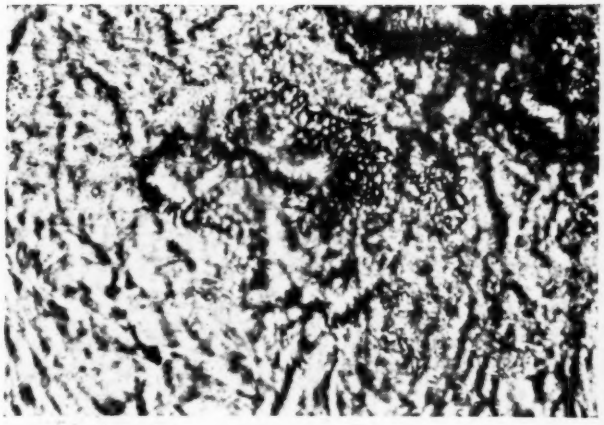

FIG. 8.—Unfixed frozen section of tongue with actinobacillosis lesion. The "rosettes" (clubs) stand out as refractile bodies. approximately × 200.

FIG. 1.—Lateral radiograph of stifle joint of Friesian cow, showing extensive formation of osteophytes.

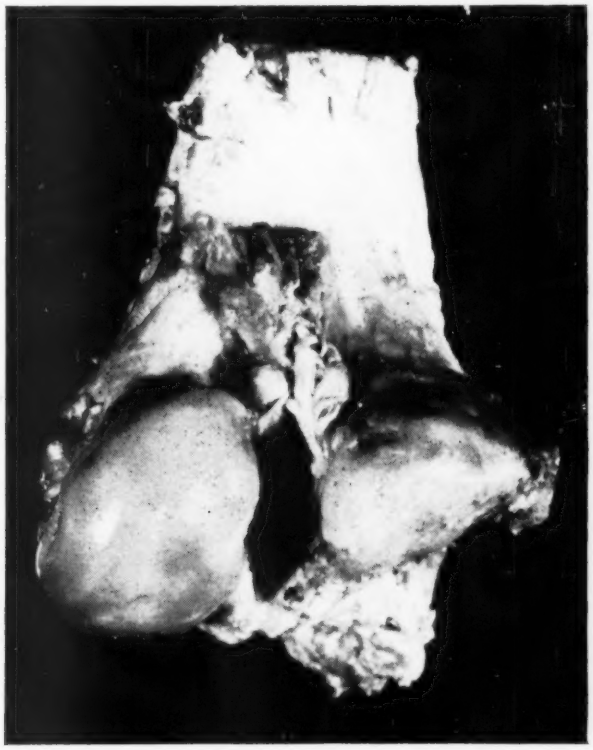

FIG. 2.—Distal extremity of femur. Note destruction of one femoral condyle.

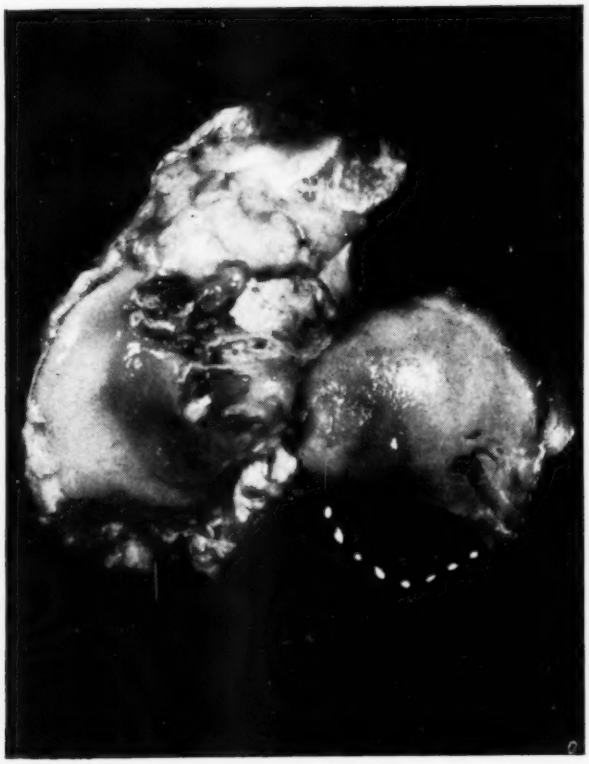

FIG. 3.—Proximal articular surface of tibia. Note destruction of the posterior rim of the lateral condyle (normal line of rim marked with dotted line).

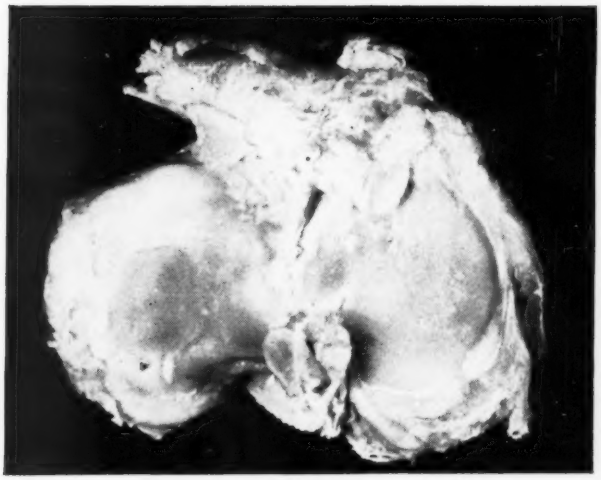

FIG. 4.—Proximal articular surface of tibia. Note area of eburnation on lateral condyle.

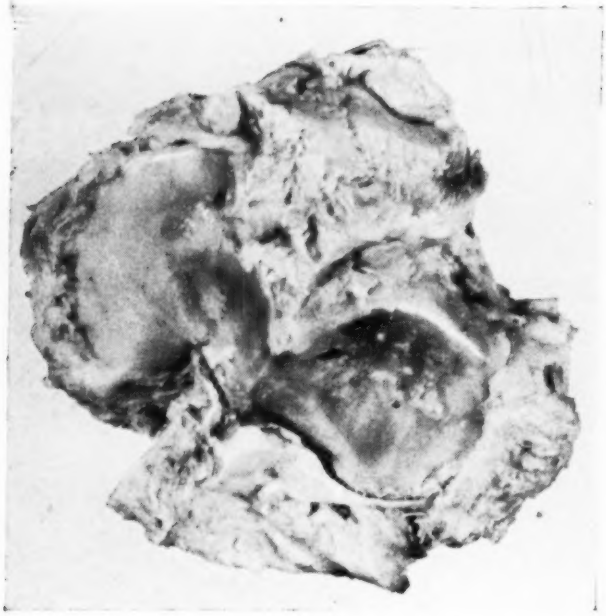

FIG. 5.—Proximal articular surface of tibia. Note eburnation of entire surface.

FIG. 6.—Interior of femoro-tibial joint. Note "bucket-handle" tear in medial meniscus.

FIG. 7.—Head of femur. Note eburnation and crater formation.

FIG. 8.—Eburnation and crater formation on articular surface of femoral head and acetabulum.

and lateral aspects of the femoral trochlea. In these latter situations the osteophytes appeared in the form of overhanging ridges often with a delicate lacework pattern. Osteophytes were also well marked at the margins of the femoral and tibial condyles, and occasionally at the periphery of the patella.

New bone in the form of plaques was also found in the substance of the capsular tissue. Some of these plaques were isolated but others seemed to link up with the marginal osteophytes. So numerous were the plaques in one particular joint that incision through the joint capsule was made difficult; and in this instance a little more than 100 plaques of bone, of about postage stamp size, were isolated after the joint had been macerated.

(e) *Loose-bodies*

Fragments of osseus tissue, cartilage and strands of fibrin, were found floating freely in the synovia in grossly damaged joints.

(f) *Synovial Fluid*

The synovia rarely appeared to be excessive but in most cases it was very turbid. Synovia was collected from the joints of 6 of the animals and subjected to bacteriological examination. On every occasion the fluid was found to be sterile.

(g) *Ligaments*

The partial or complete rupture of one or both of the cruciate ligaments was a constant finding where there were gross changes in the joint. On no occasion, however, was a rupture of a lateral or medial femoro-tibial ligament seen.

(h) *Joint Capsule*

In every joint dissected, the capsule was found to be grossly thickened as a result of fibrosis, and tough to cut with a knife. The synovial intima was smooth and mostly rather reddened.

Hip Joint

As can be seen in the Table, only 2 animals with arthritis of the hip were examined. Both were bilaterally affected and the lameness was of long standing.

(a) *Cartilage*

There were large areas of total cartilage loss from the dorsal aspect of the femoral head and from the acetabulum.

(b) *Bone*

Where there had been loss of cartilage the femoral head and acetabulum had become eburnated and was in places deeply pitted (Figs. 7 and 8). The femoral head in each instance had changed markedly in contour, having become flattened. Similarly the shape of the acetabulum had changed, to become shallow.

(c) *Osteophytes*

Exostoses were present around the rim of the acetabulum and also at the margins of the femoral head. A considerable mass of new bone had also formed at the edge of the obturator foramen nearest to the acetabulum.

(d) *Ligament*

In each hip of one animal the teres ligament was undamaged, whereas in the second case only a few tattered remnants of the ligament remained in both the hip joints.

(e) *Joint Capsule and Synovial Fluid*

There was marked capsular fibrosis. The synovial fluid was normal in colour, consistency and quantity.

Discussion

Osteoarthritis is a morbid condition of synovial joints. In man it occurs principally in the weight-bearing joints, *i.e.* those in the lower limbs, and frequently is monarticular. It may rise at any period of adult life but is particularly common from middle-age onwards. As far as the aetiology is concerned, it is widely accepted that osteoarthritis is fundamentally a mechanical disorder stemming from damage to the articular cartilage caused by injury, mis-alignment of the joint, or disease. Whatever the primary cause, however, the morbid anatomy of all osteoarthritis is essentially the same.

The increased frequency of osteoarthritis with advancing years can be explained by the tendency for articular cartilage to undergo degeneration with age as a result of which it is less able to withstand injury.

The progress of the disease is not difficult to understand. A focus of cartilage damage produces a disharmony between the opposing joint surfaces which leads to further cartilage loss; this upsets the relationship even more and the chain of events continues irrevocably until all the structures in the joint are damaged beyond repair.

There is every likelihood that oestoarthritis in cattle is initiated in the same way, and follows the same course as in man. The rate of progress of the disease, however, is most assuredly a great deal quicker in cattle because from the time of the initial injury the limb is never rested and the mechanical forces at play, in the stifle joint in particular, are enormous. Some indication of the rapidity at which the joint can be destroyed can be drawn from the fact that approximately half the cattle in this group were slaughtered after the lameness had lasted only 4 to 5 weeks by which time the affected joint had become severely damaged.

It is difficult to estimate the precise nature of the original lesion from the pathological findings as the latter are not usually observed until some weeks later when it is not easy to judge between cause and effect. Rupture of the cruciate ligaments has been seen constantly in grossly affected stifle joints and it may well be that this form of injury, which would greatly interfere with the balance of the femoro-tibial joint, was the initiating lesion in these instances. In other cases meniscal tears, and foci of cartilage damage, probably trigger off the chain of events that lead to the eventual destruction of the joint.

Obviously the present series of 13 cattle is too small to allow any definite conclusions to be drawn

as regards the breed, sex or age incidence of osteoarthritis in cattle. It is interesting to note, however, that 8 of the 13 cattle were more than 8 years old, an age which compares roughly with the second half of life in man and when, it will be remembered, the incidence of osteoarthritis (in man) is most frequent. While the disease has been recorded here in 5 different breeds of cattle, it is in certain parts of the country spoken of as being particularly common in the heavy breeds of cattle, especially the Hereford.

In man it has rarely been found possible to halt, let alone reverse, the progress of the disease before the joint has been completely disorganised. Treatment in man is usually along the lines of either total supression of the joint by arthrodesis or its more or less complete ablation as in arthroplasty. With these facts in mind, it is obvious that the treatment of osteoarthritis of the hip and stifle joints in cattle is out of the question. It cannot be too strongly emphasised that afflicted animals suffer intense pain, and should be relieved of their suffering as early as possible.

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INTERNATIONAL SMALL ANIMAL VETERINARY CONGRESS IN LONDON

The British Small Animal Veterinary Association announce the provisional plans for their Fourth Annual Congress to be held in London from April 20th to 23rd, 1961. The choice of date is specifically designed to allow the conference to coincide with a meeting of the American Animal Hospital Association in St. Louis in the United States. This is to permit the organisation of a transatlantic discussion between American and British veterinarians during the course of the congress. This transatlantic link, which will last for one hour, will be a direct telephone link allowing delegates on both sides of the Atlantic to listen to and take part in the discussions simultaneously. This will be the first occasion when such a link has been possible at a veterinary conference, and the organisers are indebted to Smith, Kline and French Laboratories who are providing this facility.

As the date of this conference falls between the International Veterinary Congress in Madrid and the forthcoming one in Hanover, it has also been decided to make this an occasion for a European small-animal meeting. The Congress venue has been moved this year to the Kensington Palace Hotel which has more spacious facilities and will provide an opportunity for mounting larger trade and scientific exhibitions than has been possible in the past.

Further details will be announced in the near future, but in the meantime, enquiries can be made to Mr. G. N. Henderson, B.SC., M.R.C.V.S., at Broadway House, The Broadway, London, S.W.19.

Clinical Note

Insertion of an Amalgam Filling into the Lower Canine Tooth of a Dog

JOHN RHODES
Northampton

IT is felt to be of interest as an alternative treatment to removal of the tooth following injury.

Subject. Alsatian dog aged 6 years.

History. The dog appeared to be in pain. It was salivating, holding its head on one side and pawing at its mouth. These symptoms were especially noticeable after food or drink.

Examination. The dog, an unusually large specimen, had broken off the tip of the right lower canine tooth exposing the pulp cavity. The root and gums were apparently healthy.

Treatment. The upper canine teeth can be removed if necessary without undue difficulty, but where the lower canine roots are healthy their removal is not effected without some risk of damage to the ramus. Accordingly it was decided in this case to attempt to insert an amalgam filling. The dog was anaesthetised with thiopentone sodium and the canal was enlarged for a depth of about 3 mm. with a No. 6 flat fissure bar. This was used in a hand piece attached to a dental foot engine normally used for canine dental scaling and polishing procedures. The cavity produced was then undercut using a No. 5 inverted cone bur.

The cavity was cleaned of debris and lined with a paste made by mixing zinc oxide and oil of cloves.

The amalgam filling material was prepared by grinding the amalgam granules with mercury in a pestle and mortar. When thoroughly mixed, it was squeezed through a muslin cloth to express any excess mercury and forced into the cavity with moderate pressure. The surface was smoothed level with the surface of the tooth and allowed to harden.

On recovery the dog showed no indication of discomfort or even awareness of the filling and has shown no pain since when eating or drinking.

Discussion. If a dental drill is not readily available, an alternative method of preparing the cavity is to remove the coronal part of the dental pulp as far as the neck of the tooth using a sharp dental spoon excavator. The cavity so produced may be lined with calcium hydroxide paste (a proprietary form of which is available under the name "Calxyl") prior to inserting the amalgam.

Although in the case described above no discomfort has been shown for the relatively short period of 7 months, it is only fair to say that other veterinary surgeons have experienced the development of apical abscesses following the insertion of amalgam fillings in the teeth of dogs.

Current Literature

BOOK REVIEWS

Veterinary Applied Pharmacology and Therapeutics. P. W. DAYKIN. Pp. 767 + viii. Baillière, Tindall & Cox, London. 55s.

"Veterinary Applied Pharmacology and Therapeutics" by P. W. Daykin is described on the title page as "formerly Hoare's Veterinary Materia Medica and Therapeutics." Though this new book is thus intended to take the place of the old one by Hoare which ran through 6 editions, it is only fair to the author of the new work to make quite clear that he has not produced another edition of the former publication but has prepared an entirely new text.

The present book is conveniently divided into 5 parts. Part One, headed introduction, consists of 5 chapters dealing with a general introduction, weights and measures, prescription writing and vegetable drugs.

Part Two, Systematic Materia Medica, contains 16 chapters arranged conventionally according to the various systems of the body. Part Three, Chemotherapeutics, extends to 12 chapters and deals with the Antibiotics, Sulphonamides and Miscellaneous Chemotherapeutics. Part Four, Specific Therapeutics and Biologicals, has 5 chapters, 2 on vitamins, 2 on hormones and one on vaccines and sera. Part Five, designated Miscellaneous, has 2 chapters respectively on Pharmacy and Legal Obligations. There is an appendix of Latin abbreviations, a Therapeutic Index and a General Index.

No one reading this book can fail to be impressed with the immense amount of work the author has put into preparing his text, a view that is supported by a study of the very extensive lists of references furnished at the ends of the chapters. The book furnishes a reservoir of information on a group of subjects with which both student and practitioner must be familiar and up to date. Unfortunately this general comment of approval and of welcome to the new book must be qualified by the need to draw attention to some of the shortcomings encountered in a detailed reading of the text. While not all of these are of major importance, they are in the aggregate of much more than minor importance. The following examples are by no means a complete list.

In Part I there is a warning against confusing summation with synergism, followed by the statement that the dividing line between the two is not very precise. The author still adheres to the Apothecaries' System of weights though this has long since been officially discarded as has the system of scribing symbols. The directions for prescription writing advocate that prescriptions be written in English but the directions to the dispenser be written in Latin. Surely the whole prescription should be written in English?

In Part II the reader very soon encounters difficulties created by failure to adhere to the method of describing drugs under the various body systems, so that the description of a drug taken under one system is extended to its action on other systems of the body. Subsequently, the drug may be described again under one or other of the body systems. This leads both to confusion and repetition.

Thus on page 63 under Antisialics (Alimentary System) the reader is introduced to atropine and on the next two pages the actions of atropine on the eye are described. On page 185 under the heading of Fluid Balance and Electrolytes the sodium salts are under discussion and sodium bromide is mentioned as a nerve sedative. On page 187 under the same heading sodium iodide is dealt with in two paragraphs referring to its use in actinobacillosis and ringworm, the statements on ringworm being repeated on page 431. On page 191 potassium iodide appears still under the main heading of page 185. On the same page potassium permanganate is dealt with solely as an antiseptic. Arecoline receives mention as an anthelmintic for dogs on pages 91 and 106 and 108. On page 91 the dose is given as ¼ gr. per 20 lb. bodyweight, on page 108 as 1/12th gr. per 12 lb., a difference in a 60-lb. dog as between ¾ grain and 5/12th grain. The miotic action of physostigmine is described on page 92 under the heading of purgatives. Potassium bromide is dealt with in equal detail on pages 190 and 220.

The system of cross-headings and side headings is at times most confusing; thus on page 63 Antisialics is a general heading but receives equal emphasis with atropine one of the examples. On page 88 there is a heavy type heading Aloes, B.Vet.C., but cascara, rheum and the synthetic anthraquinones follow with only the use of italics when first mentioned. The correct setting would have been a heading Anthracene Purges followed by aloes, etc., as inserted side-headings.

On page 95 under the heading metallic astringents the combination of ferrous sulphate and sulphuric acid is mentioned as a scour drench and recommended in the treatment of Johne's disease. This is followed by a description of the haematinic properties of iron. The same details are repeated on page 179. It is not clear whether the author is basing these statements in regard to Johne's disease on his own experience or is merely repeating an outworn and long disproved fetish.

On page 116 nicotine sulphate is recommended as an anthelmintic for cattle without any warning of its notorious toxicity for this species.

On page 198, under the heading of Fluid Balance and Electrolytes, sodium calciumedetate is discussed as an antidote to lead poisoning. These statements are repeated on page 391 under the heading of Astringents and Haemostatics (acting on skin).

On page 266 sodium phenobarbitone is advocated in the treatment of scrapie in cattle, but the disease does not occur in cattle.

On page 605 in the chapter on vitamins, bracken poisoning of horses is discussed as an aneurin deficiency, and under the heading of uses of aneurin there appears the statement that in cattle butyl alcohol (presumably di-butyl alcohol) gave up to 80 per cent. recoveries, but there is no indication that

the pathogenesis of bracken poisoning in cattle is entirely different from that in horses, nor is there any indication that the actions of the two substances are entirely different.

Some rather important omissions from the book have been noted, among them being diethylcarbamazine, oil of arachis, phenoxymethylpenicillin and the salts of bephenium.

Part III on antibiotics and sulphonamides is perhaps the most satisfactory part of the book and deserves commendation. Unfortunately the chapters on hormones in Part IV are not so satisfactory and there is a good deal of confusion in regard to the uses of cortisone, prednisone and prednisolone.

The chapter on vaccines and antisera is a brief and uncritical list of vaccines and antisera in common veterinary use. It seems hardly proper to include under the heading of vaccines and antisera diagnostic agents such as mallein and tuberculin.

In some parts of the book the author goes far beyond the realms of applied pharmacology and therapeutics and strays into the whole realm of veterinary medicine dealing with epidemiology, aetiology and diagnosis. These excursions are inconsistent and therefore the book is very uneven in its coverage. A great deal of space is occupied by the discussion in detail of ineffective and outmoded forms of treatment.

The discerning reader may find some parts of this book of value, but it will be for the individual teacher to decide whether he wishes to recommend it to his students.

A Stereotaxic Atlas of the Dog's Brain. R. K. S. LIM, C. N. LIU and R. L. MOFFITT. Blackwell, Oxford. 74s.

This atlas is designed to provide the necessary co-ordinates for using the stereotaxic instrument in the dog. For this purpose all types of dog are suitable, except those with very short or long noses. The modified stereotaxic instrument is described and illustrated. There are photographs of the dog's head in sagittal, horizontal and coronal planes and drawings of surface markings of the brain. In addition there are 46 photographs of interrupted serial sections of the brain (magnified about ×4), stained for myelin and nerve cells; with each of these photographs there is a complementary line drawing with the various anatomical parts labelled. The small size and poor quality of the photomicrographs makes recognition of tract and cellular detail difficult. Although the authors claim to provide only a guide for the localisation of the major structures in the brain, it is a pity that the opportunity was not taken to illustrate fibre systems and nuclear masses in greater detail. However, the publication is of much value to those wishing to use the stereotaxic technique in dogs and should be welcomed also by those interested in canine neurology, neuropathology and anatomy.

Aids to Biochemistry. S. P. DATTA and J. H. OTTAWAY. 5th edition. Baillière, Tindall and Cox. 15s.

This book covers, in the first 100 pages, the chemistry of compounds of biological importance. It then deals concisely with the basic biochemical reactions which take place in the body. Chapters on digestion and metabolism of carbohydrates, fats, and proteins, and the end-products of metabolism, are included, as well as additional chapters on the chemistry of blood, detoxication, energy requirements and accessory food factors.

The subject matter is based on a course in biochemistry to pre-clinical medical students, and, as the title implies, is meant to be used as a supplement and not a substitute for the standard text-books of biochemistry. From the veterinary viewpoint, although it lacks any direct reference to the domestic animals, it still provides a concise text of biochemistry necessary as background knowledge and is an excellent book for those members of the veterinary profession who wish to refresh their biochemical knowledge without the tedium of reading too many academic details.

Physiology of Lactation. R. V. SMITH. 5th edition. Constable & Co., London (1959). 45s.

This book is in direct descent from "Secretion of Milk" and it supersedes the 4th edition of that work by Espe and Smith. The change in title implies a wider approach to the whole subject of lactation and the book is a very adequate exposition of most of the many facets of milk secretion. The author has not stated for whom the book is intended, but the nature of the references and the copious bibliography can only be for readers well grounded in the biological sciences. Readers of this journal will be relieved to know that this is not yet another offering from the "potted science for farmers" school.

Inevitably the discussion centres round our knowledge of lactation in the cow, but it provides much comparative information in many places. The first 3 chapters are devoted to growth, development and the anatomy of the mammary gland. The chapter on anatomy of the udder is a competent outline and although it probably does not contain the detail that a surgeon might need, it gives more information than some current text-books of veterinary anatomy. The next 3 chapters are concerned with the hormonal, physiological and biochemical aspects of lactation, and the 6th chapter on the Physiology of Milking logically leads on to the Mechanics of Milking in the 7th chapter. This is a chapter which many clinicians engaged in mastitis control will find a useful background to the supervision of proper machine milking, and in this chapter and others the various effects of mastitis are mentioned. However, the effects of disease, understandably in a physiological text-book, are not extensively discussed. Chapter 9 on Environmental Factors Affecting Lactation contains a variety of information on topics such as drying off, *pre-partum* milking, the effect of drugs on the udder and their excretion in the milk. The last chapter deals with the effect of diet on the amount and the composition of milk.

This is a useful book to all who are concerned with a scientific understanding of the cow and the way she produces the material on which the whole dairy industry depends.

B.V.A. Annual Congress: Glasgow 1960

For the benefit of intending delegates to the Congress which is to be held in Glasgow from August 28th to September 3rd, a list of hotels is appended. The Provisional Committee wish to make it known that there is urgency in this matter because of the tourist season. As well as the accommodation tabulated below, a number of rooms are available for men only in the University hostels which, although less congenial than the hotels, are conveniently sited and have a lower tariff (bed and breakfast 20s.). Any members who wish to make reservations in hostels are asked to inform the honorary local secretary, B.V.A. Congress, University of Glasgow Veterinary School, 83 Buccleuch Street, Glasgow, C.3.

Some members, and particularly those with families, may like to take advantage of the holiday facilities on the Clyde coast although it should be noted that one day of Congress week will be occupied by a sail from Glasgow on the river and firth. Of the resorts, Helensburgh, Gourock and Wemyss Bay have most to recommend them ; they are points of embarkation for steamers and are within 40 to 60 minutes of Glasgow by train or road.

Those who intend to make Congress part of a holiday in Scotland will find useful information in the publications, Holiday Guide to Scotland (price 1s. 6d., British Railways), and Where to Stay in Scotland (price 2s. 6d., Scottish Tourist Board, 2, Rutland Place, Edinburgh, 1). It may be of interest, too, that the International Festival will be held in Edinburgh from August 21st to September 10th. An excursion to the Military Tattoo at Edinburgh Castle has been arranged during Congress week.

Further information on accommodation or other amenities in Glasgow and surrounding district may be obtained from the honorary local secretary.

GLASGOW HOTELS

Hotel and Address	Telephone	No. rooms currently available		Terms B & B from	Miles from University	
		Double	Single			
Central Area						
Central Hotel, Gordon Street (Headquarters hotel) ...	Central 9680	20	20	53/–	2	L
Allan's, 931 Sauchiehall Street, C.3	Western 4112	25	5	22/6	1½	LC
Bath Hotel, 152 Bath Street, C.2	Douglas 7416	11	22	30/–	1½	LC
Bon-Accord Hotel, 7 Park Terrace, C.3	Douglas 2481	6	3	25/–	1	LC
George Hotel, 235 Buchanan Street, C.1	Douglas 6622	16	10	35/6	2	LC
Green's Hotel, 22 Woodlands Terrace, C.3	Douglas 4976	4	0	30/–	1½	UC
Ivanhoe Hotel, 185 Buchanan Street, C.2	Douglas 7284	20	5	33/–	2	L
Kenilworth Hotel, 5, Queen Street, C.1	Central 5151	10	10	27/6	2	LC
Linden Hotel, 19/20 Woodside Terrace, C.3...	Douglas 4600	30	0	22/6	1	LC
More's Hotel, India Street, C.2	Central 2641	5	2	39/6	1	LC
North British Hotel, George Square	Douglas 6711	25	20	44/–	2	L
Park Gate Hotel, 1/3 Park Gate, C.3...	Douglas 0810	16	0	25/–	1	LC
Royal Hotel, 106 Sauchiehall Street, C.2	Douglas 3416	10	0	36/–	2	LC
St. Enoch Hotel, St. Enoch Square, C.1	Central 7033	30	20	40/–	2	L
Woodlands Gate Hotel, 10/11 Lynedoch Place, C.3 ...	Douglas 6123	6	0	21/–	1	UC
Western Area						
Belhaven Hotel, 23 Belhaven Terrace	Western 7307	8	3	30/–	1	UC
Benervie House Private Hotel, 15 Buckingham Terrace, Great Western Road	Western 7143	6	2	17/6	1	UC
Botanic Gardens Hotel, 6/7 Grosvenor Terrace, W.2 ...	Western 2888	8	4	21/–	1	UC
Cleveden Gate Hotel, 14 Hyndland Road, W.2	Western 6153	5	2	21/–	2	UC
Devonshire Hotel, 5 Devonshire Gardens, W.2	Kelvin 1308	5	5	22/6	1½	UC
Great Western Hotel, 11/12 Botanic Crescent, N.W. ...	Maryhill 1287	10	6	22/6	1	UC
Kensington Hotel, 12 Kensington Gate, W.2	Western 6466	5	5	21/–	1½	UC
Peripheral						
Boulevard Hotel, Great Western Road, Clydebank ...	Duntocher 2381	4	4	35/–	5	L
Buchanan Arms, Drymen, Stirlingshire	Drymen 310 & 270	4	0	35/–	28	L

L = Licensed. U = Unlicensed. C = Some reduction for children has been specified.

NOTE.—Members are asked to mention the British Veterinary Association when making hotel reservations.

News and Comment

Prince Gorm of Denmark, whose stay in this country was mentioned in THE VETERINARY RECORD last week, is seen here, at a cocktail party given in his honour, with the President of the B.V.A., Mr. S. L. Hignett, and Dr. W. R. Wooldridge. Host to the party was Dr. W. M. McKay, International Agricultural Scientific Co-ordinator to Cyanamid Ltd.

THE PARLIAMENTARY AND SCIENTIFIC COMMITTEE

The Duke of Edinburgh was the guest of the Parliamentary and Scientific Committee at an informal luncheon held at the House of Commons last Tuesday. During the discussion which followed, on the general subject of the application of science to industry, Dr. W. R. Wooldridge spoke on the application of modern veterinary science to the agricultural industry. A number of well-known parliamentarians and eminent scientists spoke also.

PERSONAL

Mr. T. M. Doyle was awarded the Victory Medal of the Central Veterinary Society at its April meeting.

Births

BLACKMORE.—On June 20th, 1960, to June, wife of David Killock Blackmore, B.SC., M.R.C.V.S., of 12, Green Close, Brookmans Park, Hatfield, Herts., a son, Timothy Killock, a brother for Corinne Belinda.

HEPTINSTALL.—On June 22nd, 1960, at Barrow in Furness, to Joan (*née* Whiteford) and Jack Heptinstall, MS.R.C.V.S., a daughter, Lesley Elizabeth.

LANGMAN.—On June 12th, 1960, to Jane (*née* James), wife of Boyd A. Langman, B.V.SC., M.R.C.V.S., of Sarac, Ashford, Kent, a daughter, Claire Elizabeth.

MACPHERSON.—On June 22nd, 1960, to Sheelagh, wife of Ian Macpherson, B.V.SC., M.R.C.V.S., at Northallerton, Yorkshire, a daughter, Sally Fiona.

ROBINSON.—On June 11th, 1960, to Doreen, wife of J. S. Robinson, M.R.C.V.S., of Mill House, New Romney, Kent, a son, David Geoffrey.

WARREN.—On June 2nd, 1960, at Beckenham, Kent, to Elsa (*née* Uhrig), wife of A. G. Warren, B.SC., M.R.C.V.S., a brother for Angela (Louis George).

WILLS.—On June 12th, 1960, to Catherine, wife of Peter Wills, B.V.M.S., of Thorngumbald, Nr. Hull, a son.

Engagement

MELLUISH—ANDERSON.—The engagement is announced between Hugh K. Melluish, M.R.C.V.S., second son of Lt.-Col. R. K. Melluish, O.B.E., and Mrs. Melluish of Rossall School, Fleetwood, Lancs., and Miss Elizabeth A. M. Anderson, younger daughter of Mr. and Mrs. George Anderson of Hooton, Wirral, Cheshire.

Marriage

KENNEDY—MOFFITT.—At Alnwick, Northumberland, on June 11th, 1960, Andrew S. Kennedy, B.V.M.S., M.R.C.V.S., of Thornhill, to Joan Moffitt, S.R.N., of Alnwick.

R.C.V.S. OBITUARY

We record with regret the death of the following member of the profession:—

SCOTT, Walter, D.V.O., Kings End, Powick, Worcester. Graduated July 15th, 1925, at the Royal (Dick) Veterinary College, Edinburgh. Died June 25th, 1960, aged 56 years.

UNIVERSITY NEWS

Edinburgh

The undermentioned candidates have passed the Final Professional Examination (Part 1) in the subject of Veterinary Hygiene for the degree of Bachelor of Veterinary Medicine and Surgery:—

Anderson, Euan C., Broome, Brenda M., Carwardine, Paul C., Cooper, Michael J., Davies, Charles S., Foggie, Janet, Fraser, Thomas W., Haigh, Arthur J. B., Hoskin, Brian D., Kirk, James O., Kirkham, John, McNab, Ian, Marsh, Ian A., Mighell, John S., Muirhead, Michael R., Pearson, Clifford, Pearson, Michael V. M., Reece, Peter, Sansi, Kamoru A. O. O., Stewart, Colin G., Sutherland, Stewart D., Williams, David A., Wood, Hamish, and Young, Godfrey F.

The undermentioned candidates have passed in the subject of Veterinary Anatomy and Histology of the Second Professional Examination for the B.V.M. & S. degree:—

McLeod, Alexander P., Thatho, Mphunyetsane M. R., and Watkins, John H.

The undermentioned candidates have passed in the subject of Veterinary Physiology (including Biochemistry) of the Second Professional Examination for the B.V.M. & S. degree:—

Doe, Ian, Forbes, Anne, Freer, Roger J., Hill, Michael, Jackson, Peter S., Jones, Alfred G., Mews, Alastair R., Phororo, Daniel R., Rowntree, Philip G. M., and Taylor, David R.

Bristol

A dissertation submitted by Mrs. D. C. Payne has been approved for the degree of Doctor of Philosophy. The thesis was entitled "Observations on the functional anatomy of the lungs and air sacs of Gallus domesticus." The work, which was under the supervision of Dr. A. S. King, was carried out in the Department of Veterinary Anatomy and financed by the Agricultural Research Council.

Glasgow

The following students passed their final B.V.M.S. examination and will graduate on July 9th:—

Banks, Ian, Baxter, John S. Begg, Thomas B., Brander, Eric J. G., Brown, Alistair G., Calver, Peter, Campbell, Joseph, Harvey, Ian M., McLaren, Duncan M., Paul, Samuel L., Reid, William J., Robson, Bruce A., Rumford, Alastair K., Shirkey, Ian B., and Wyllie, James M.

The following passes are announced in the Second Professional Examination for the degree of B.V.M.S.:—

PART I (ANIMAL MANAGEMENT)

Abraham, J. A., Binaisa, G. K., Boyd, J. S., Cockburn, R. M. S., Cowell, J. L., Davies, W. R., Driver, J. C., Erhiaganoma, E. J., Gibson, M. W., Glen, J. B., Gold, Miss M. A., Halliday, G. J., Houston, Miss J., Kerr, P., Kitto, H. W., Logue, J. H., Macarthur, A. W., Macauley, B., Miller, A. M., Sayer, P., Scott, J. A., Smith, G. E., Tainsh, C. L. R., Wallace, J., and Young W. B.

Third Professional Examination

PART I (PHARMACOLOGY AND MATERIA MEDICA)

Clark, J. C., Deans, R. W., Dudlyke, R. G., Garland, A. J. M., Gray, J. B., Greaves, L. J., Harries, W. N., Hill, A. T. M., Hodges, T. G. G., Howard, B. R., Jarrett, J. O., Kyle, P. C., Longstreeth, J. R., Macdonald, S. C., McEwan, A. D., McGaughey, Miss M., Mackey, Miss L., Murray, M., Cyekola, L. L., Rees, R. J., Reid, J. F. S., Riley, F. B., Ritchie, J. S. D., Scholes, R. W., Shaw, D., Shepherd, M. T., White, Miss S., Wright, N. G., and Wyburn, R. S.

PART III (ANIMAL HUSBANDRY AND PREVENTIVE VETERINARY MEDICINE

Abraham, J. A., Alexander, G. F., Atang, P. G., Crawford, I., Dabell, J. S., Dawe, P. S., Evans, Miss J. I., Ferguson, D. A., Heeley, Miss R. M., Hughes, R. E., Ingram, J. F. W., McLelland, J., Miller, D. J. S., Miller, J. A., Mollison, A., Morrison, A. N., Nyarko, D., Peek, I. S., Richards, R. S., Russell, T. M., Saunders, R. W., Selman, I. E., Shaw, D., Smeaton, P. D., Stewart, I. A., Sutherland, G. D. M., Todd, J. N., Wheeldon, Miss A., Wilson, A. F. W., Wilson, R. J. W., and Wishart, D. F.

Liverpool

The degree of D.V.Sc. is to be awarded to Mr. T. E. Gibson and that of M.V.Sc. to Mr. R. L. Cornwell.

At its meeting on June 21st, the Council of the University approved the appointment of Mr. A. C. Shuttleworth, M.V.SC., F.R.C.V.S., Senior Lecturer in Veterinary Surgery, as Reader in Veterinary Surgery, as from October 1st, 1960.

Degree of B.V.Sc. with Honours, Class II

Allen, W. M.

Ordinary Degree of B.V.Sc.

Batty, A. F., Capron, T. K., Chesworth, A. T., Dawkes, B. H., Edwards, J. D. D., Evans, W. E. S., Fell, C., Gyening, K. O., Hardy, B. D. W., Holt, H. J., Hopkins, D. L., Jones, G. W., Jones, R. S., Miller, J. K., Milner, N. A., Peel, D. R., Pickup, Pamela, Procter, G, Rigby, J. P., Shreeve, B. J., Taylor, K. C., Thomas, J. K., Vaughan, A., Walker, D., Walker, J. M., and Zagni, P. A.

Final Examination (Part I) only

Davies, J. O.

Final Examination (Part II) only

Fitton, M. W., and Zanetti, P. J.

B.V.Sc. First Examination

PART I (CHEMISTRY)

Byrne, D. J., Charnock, M., Chew, P., Clement, J. E., Cross, Janet A. H., Davies, J. A., Duckworth, R. H., Edginton, A. B., Evans, G. R. E., Evans, M. H. D., Fasawe, T. C. K., Fox, R. I., Frith, Margaret, Gough, P. J., Hennessey, Marie C., Holness, Sheila, Jones, D. E., Lawson, J. B., Lee, R., Mann, J. A., Metcalfe, D. T., Parsons, G. A. T., Price, D. L., Stocks, A. G. H., Thomas, G. J. S., Topping, A. R., Wade, A. J., and Wiggett, I.

PART II (PHYSICS)

Byrne, D. J., Charnock, M., Chew, P., Clement, J. E., Cross, Janet A. H., Dolan, M. S., Duckworth, R. H., Edginton, A. B., Evans, M. H. D., Fasawe, T. C. K., Fox, R. I., Frith, Margaret, Gough, P. J., Hennessey, Marie C., Holness, Sheila, Jones, D. E., Lawson, J. B., Lee, R., Mann, J. A., Metcalfe, D. T., Parsons, G. A. T., Price, D. L., Stocks, A. G. H., Terry, J. E., Thomas, G. J. S., Topping, A. R., Wade, A. J., and Wiggett, I.

PART III (BOTANY)

Bairds, J. M., Byrne, D. J., Charnock, M., Chew, P., Clement, J. E., Cross, Janet A. H., Davies, J. A., Dolan, M. S., Duckworth, R. H., Edginton, A. B., Evans, G. R. E., Evans, M. H. D., Fasawe, T. C. K., Fox, R. I., Frith, Margaret, Gough, P. J., Hennessey, Marie C., Holness, Sheila, Jones, D. E., Lawson, J. B., Lee, R., Mann, J. A., Metcalfe, D. T., Parsons, G. A. T., Price, D. L., Stocks, A. G. H., Terry, J. E., Thomas, G. J. S., Topping, A. R., Wade, A. J., and Wiggett, I.

PART IV (ZOOLOGY)

Evans, G. R. E.

U.F.U. AWARD FOR VETERINARY SURGEON

The Ulster Farmers' Union announces that Dr. David Luke, senior veterinary research officer in charge of pig and poultry disease research and advisory work at the Veterinary Laboratory at Stormont, is to receive the Union's award for 1960 in recognition of his work.

The award—the "Belfast Telegraph Cup"—is given annually to a farmer or research worker, and in deciding the winner, the judges have special regard for such scientific developments and new methods as will improve quality, save costs and be capable of general application. Dr. Luke was nominated for the award by the Union's Antrim Poultry Club. He is the second Ministry of Agriculture scientist to receive the award, which carries with it a gold medal.

COMING EVENTS

July

6th (Wed.). Meeting of the Technical Development Committee of the B.V.A., at 7, Mansfield Street, 10.30 a.m.

Meeting of the Dumfries and Galloway Division in the Crown and Mitre Hotel, Carlisle.

Annual General Meeting of the Lincolnshire and District Division at the George Hotel, Grantham, 2.15 p.m.

8th (Fri.). Meeting of the North of England Veterinary Medical Association in the Agricultural Lecture Room, King's College, Newcastle-upon-Tyne, 2.30 p.m.

13th (Wed.). Summer Meeting of the Lancashire Veterinary Association at the University of Liverpool Veterinary Field Station, "Leahurst," Neston, 2.30 p.m. Dinner at the Hotel Victoria, Heswall, 7 p.m.

The summer meeting of the Mid-West Veterinary Association will be held at the Limpley Stoke Hotel, Limpley Stoke, 7.45 a.m.

Annual General Meeting of the Animal Diseases Research Association, Moredun Institute, Gilmerton, Edinburgh, 9, 3 p.m.

14th (Thurs.). Summer meeting of Northern Region Association of Veterinary Teachers & Research Workers at Sutton Bonnington, 11.30 a.m.

August 28th to September 3rd. 78th Annual Congress of the British Veterinary Association in Glasgow.

B.V.A. COMMITTEE AND COUNCIL MEETINGS IN LONDON, JULY, 1960

Tuesday, July 19th, at 7, Mansfield Street
Finance Sub-Committee.

Wednesday, July 20th, at 7, Mansfield Street
10 a.m. Farm Livestock Committee.
11.30 a.m. Home Appointments Committee.
2.15 p.m. Veterinary State Medicine Committee.
4 p.m. Parliamentary and Public Relations Committee.

Thursday, July 21st, at 7, Mansfield Street
10.30 a.m. Small Animals Committee.
2.15 p.m. General Purposes and Finance Committee.

Friday, July 22nd
10.15 a.m. Council Meeting in the Great Hall of the Royal Veterinary College, Camden Town, N.W.1.

ADDRESSES OF DISEASE INFECTED PREMISES

The list given below indicates, first the county in which are situated the premises on which disease has been confirmed, followed by the postal address and date of outbreak.

Anthrax

Angus. Nether Careston, Brechin (June 23).

Lincs. Rose Farm, Marston, Grantham (June 27).

Renfrew. Whitemoss Farm, Bishopton (June 24).

Somerset. Orchard Close, Wanstrow, Shepton Mallet (June 21).

Sussex. Old Mill Farm, Crowborough Warren, Crowborough (June 21).

Fowl Pest

Essex. 3, Rye Walk, Ingatestone (June 22); 616, Rayleigh Road, Hutton, Brentwood (June 23); Greenacres, Harts Lane, Ardleigh, Colchester (June 26); 608, Rayleigh Road, Hutton, Brentwood (June 27).

Lincs. Stone Farm, Greetwell Road (June 22); No. 24, Mainwaring Allotments, Lincoln (June 24).

Norfolk. Homelea, Toftwood, East Dereham (June 22).

Notts. Nicker-Bush Farm, Walesby, Newark (June 22).

Salop. Brockdon Mill, Lydbury North (June 22); Little Bicton, Clun, Craven Arms (June 24); Picton, Clun, Craven Arms; 2, Brockton, Lydbury North (June 25).

Worcs. Bungay Lake Farm, Timberhanger, Bromsgrove (June 24).

Swine Fever

Bucks. Outfield Farm, Bowstridge Lane, Chalfont St. Giles (June 27).

Ches. Green Lane Farm, Heaton Moor, Stockport (June 21).

Dorset. Manor Farm, Silton, Shaftesbury (June 23).

Essex. Clarkes Farm, Fyfield, Ongar (June 23); The Laurels, Hullbridge Road, South Woodham, Chelmsford; Sturgeons Farm, Writtle, Chelmsford (June 27).

Flints. Belgrave Farm, Northop, Mold (June 27).

Hereford. Flights Farm, Ledbury; Upper House Farm, Risbury, Leominster (June 27).

Kent. Brickfield Piggeries, Westwood, Margate (June 21); Rear of "Glenmere," 9, Tothill Street, Minster, Ramsgate (June 23); Green Acres, Smeeth, Ashford (June 27).

Lancs. Altys Farm, Formby, Liverpool; Lower Whitehalgh Farm, Feniscowles, Blackburn (June 21); St. Michael's, Preston (June 24).

Norfolk. Hill House, Cawston, Norwich; Pennygate, Barton Turf, Norwich (June 21); The Poultry Bungalow, Forncett St. Peter, Norwich (June 24).

Salop. Halford Farm, Myddle, Shrewsbury; Roden Villa, Aston Road, Wem, Shrewsbury; Lower Brands Farm, Stirchley, Dawley, Wellington (June 27).

Somerset. The Piggeries, Yarrow, Mark, Highbridge; Hamwood Farm, Trull, Taunton (June 23); Hill House, Shapwick, Bridgwater; Mountain Ash, Stoke Lane, Stoke St. Mary, Taunton (June 27).

Staffs. The Grange Farm, Hollies Lane, Pattingham, Wolverhampton (June 21).

Suffolk. 6, California Lane, Hintlesham, Ipswich (June 21).

Yorks. Bridge Farm, Haddlesey, Selby (June 21); Church Hill, South Cave, Brough (June 23); Leeds Road, Thorpe Willoughby, Selby (June 27).

Letters to the Editor

The views expressed in letters addressed to the Editor represent the personal opinions of the writer only and their publication does not imply endorsement by the B.V.A.

Radiotelephone Equipment

Sir,—Radiotelephone equipment is frequently used on a hire-maintenance basis by members of the profession, this method being advantageous in a variety of ways, including income tax relief.

I wonder if many members are aware that there is no get out clause on their side if, for any reason, they wish to give up using the equipment. The latter can only be returned if a payment is made to the Company based upon the initial price of the equipment and the remaining time that the agreement has to run.

Thus, if anybody is unfortunate enough not to require his radiotelephone equipment shortly after he enters into a hire-maintenance agreement his relatives, executors, etc., may be saddled with a very heavy payment to terminate this agreement.

Solicitors do not appear, in some cases, to warn their clients about these agreements even when one takes the trouble to ask their advice. I, personally, would never enter into such an agreement again unless some reasonable opting out clause was included.

Yours faithfully,
J. A. TOOVEY.

Church House,
St. Neots,
Hunts.
June 23rd, 1960.

Inoculation Against Distemper

Sir,—I would suggest that the vaccine and drug firms get together and contribute to a central fund, administered by a committee of veterinary surgeons, with no undue vested interest, for the purpose of drawing the attention of the public in a more decorous manner to the products they manufacture.

Mr. Carter has the idea of the type of advertisement which could be used, and we can arrange that the work of the profession be made better known at the same time.

By not being too specific we can avoid the lay public coming into our surgeries and demanding "my dog to be blancovaxed"!

An advertisement might be on the following lines:—

THE VETERINARY PROFESSION ADVISES

Your dog should be vaccinated against Distemper.
Consult your Veterinary Surgeon!

Insert suitable photograph of member in white coat, and professional surroundings, inoculating dog.

Inserted by Blank Products, makers of vaccines and drugs for use by the veterinary profession.

After a consideration of the numerous ramifications, and the increased scope of modern advertising it would appear timely for the profession to set up some committee to consider the whole matter. Problems arising out of the sort of advertising referred to above, and to the advertising of professional services generally, as well as consideration of the type and standard of advertisements appearing in THE VETERINARY RECORD and the farming press—which often leave much to be desired—are, I believe, of sufficient importance nowadays to merit more attention by the profession.

Yours faithfully,
D. G. EARNSHAW.

Department of Clinical Veterinary Practice,
Veterinary College of Ireland,
Ballsbridge,
Dublin.
June 21st, 1960.

Sir,—In reply to Mr. H. D. Coryn's letter, I have felt for a long time that a national distemper eradication campaign is not only desirable but possible and urgently necessary. What harm does a disease situation, in which our prognosis, if we are honest, is at best guarded or grave, and at worst depressingly hopeless at the outset of treatment, have on the status of our profession?

Until recently when vaccination has enjoyed wider advertisement, unless an owner read "doggy" periodicals, owned a dog which died of the disease or visited a veterinary surgery, he scarcely knew distemper for the killer it is, much less the necessity for vaccination. Surely vaccination against the "C.D Complex" could be made obligatory for obtaining a dog licence at, say, 3 months old, on the same lines as, I believe, vermifuges are supplied as an obligatory part of the licensing of dogs in Australia.

If this resulted in the cost of the licence reaching 4, 5 or 6 fold the present price, it would greatly reduce the annual slaughter of unnecessarily diseased dogs. It would also greatly reduce the wanton neglect or euthanasia meted out to the Christmas-present puppy which grew too big or became a nuisance when the child tired of it, by raising the animal's value and status towards that held by the television set with its £4 licence.

Reduced charges would have to be made for special cases, and abuses would occur, but such a plan, submitted by the B.V.A. as a Parliamentary Bill could do nothing but good for the prestige of the profession. As Mr. Coryn says, it is we who must take the initiative,—now!

Yours faithfully
LESLIE ARNALL.

The University of Liverpool,
Veterinary Hospital,
Pembroke Gardens,
Liverpool, 3.
June 20th, 1960.

Sir,—Once again I find myself writing to you to defend the policy of the company by which I am employed. I, too, have been concerned for some time about the benign way in which some members of the veterinary profession have allowed themselves to be misled. It has been with more than mere annoyance that I have in the past watched the profession blinded by repeated declarations concerning the business that they were gaining by the advertising of canine biologicals, failing to notice that at the same time thousands of pounds' worth of business was being taken from them by the sale of other biologicals direct to the farmer through farmers' co-operatives and travelling packmen. These sales have been supported by massive advertising. In many cases this advertising contained the injunction to the farmer to consult his veterinary surgeon. I presume the intention was that the farmer should consult his veterinary surgeon and then purchase his biologicals from his nearest farmers' co-operative.

My firm has been accused of jumping on the band waggon. I would like to point out that this firm did not jump on the band waggon several years ago in the marketing of its other biologicals, but continued to market through the veterinary surgeon. It seems that competitive advertising in the ethical field is to meet with the resentment of a few, whereas indiscriminate advertising and selling of other biologicals is to be tolerated and even supported. Surely if one firm is to be allowed unrestricted advertising, then other firms must be allowed to take part in the competition without restriction or complaint?

Yours faithfully,

T. STEWART.

Bayer Products Ltd.,
Neville House,
Eden Street,
Kingston upon Thames,
Surrey.

June 27th, 1960.

Vaccination of Cattle with S.19

Sir,—In this practice about 95 per cent. of the herds are "flying," and it has been our rigid policy for nearly 20 years to vaccinate adult animals when consulted—nothing indiscriminate about this!

This policy has paid untold dividends to the farmer, and as far as practitioners are concerned, it is results and a satisfied client that really count.

We have got to be doing something now and keep doing something, and not have our heads in the clouds like Dr. McDiarmid dreaming of some far off policy of eradication. Apparently this gentleman does not believe in insurance or he would not talk so glibly about discrimination—I trust he has his whole house insured and not just a part.

In this "flying herd" countryside, we shall continue to vaccinate the recently purchased cow and any other as the case demands, till such time as there is a pursued policy of marking vaccinated calves or until such time we can convince a satisfied clientele that we are wrong and that the right thing is to sit back and do nothing about it.

Yours faithfully,

W. W. BLACK.

78 Yorkshire Street,
Burnley,
Lancs.

June 25th, 1960.

"Clinics for the Cows"

Sir,—I have been surprised that the article under the above heading published in *The Farmer and Stock-breeder*, June 14th, 1960, has provoked no letter of comment or complaint in your journal. Published as it quite properly could and should have been in THE VETERINARY RECORD, it would have acted as a stimulant to those of us of whom the writer states, "that veterinary practice is static and dangerously complacent." Others might well have seen good reason to enter into argument with him, in a suggestion that it would be more economic for the farmer if each practising veterinary surgeon had a large-animal hospital. The cost of running such an establishment, with the necessary lay staff, stores of foodstuffs, etc., would be formidable—not to mention the capital outlay on building and equipment. Surely all this must be paid for ultimately by the farmer? The suggestion that a small-animal hospital would be so gratefully received and paid for by owners of "pets" that they would pay such excessive charges as to allow farmers to get hospitalisation free, sounds both improper and nonsensical. Finally the writer suggests that nationalisation would be an obvious alternative and would be welcomed by him, and that from his point of view it would be a "life saver." I wonder how many medical practitioners in this country would agree with him, or, moreover, how many of his professional confrères? For me, I hope that the stranglehold of nationalisation will never descend upon our profession, which is made up, more than any other, of men and women of widely divergent and independent ways of thought and action, and to whom freedom in all respects is the breath of life.

Published as it is in the farming press, this article can be a considerable embarrassment to practising veterinary surgeons all over the country, but most of all to those who practice in the immediate neighbourhood of the writer.

Yours faithfully,

E. P. BARRETT.

28, Stoke Road,
Guildford.

June 27th, 1960.

ADVERTISER'S ANNOUNCEMENT

CIBA LABORATORIES announce that "Vetidrex" tablets are now available for small-animal practice and for maintenance therapy in large animals.

In cats and dogs 0.5 to 1 mg. per lb. bodyweight is effective against localised oedema or that caused by cardiac or renal failure. The tablets may be used to initiate treatment or to maintain the response to intravenous or intramuscular injections. Tablets of 25 mg. are available in packs of 25 or 100.